

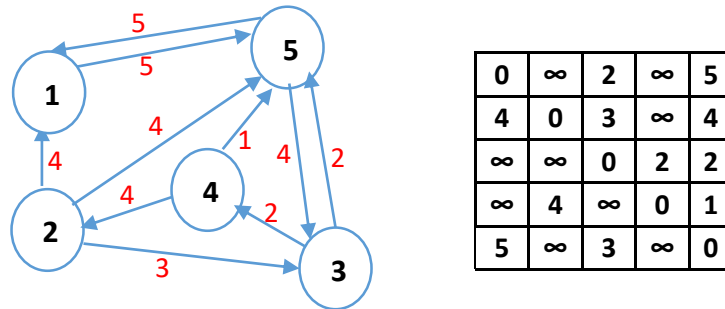
King Saud University
College of Computer and Information Sciences
CSC 311 – Take-home Exam

I. Dynamic Programming

Q1) [BONUS] Given the sequences $X = (7,9,10,3,4,1,2)$ and $Y = (8,9,2,5,3,4)$ show the execution of the Dynamic Programming algorithm to find the Longest Common Subsequence (LCS), as explained in class. Fill out the dynamic programming table, and show all solution steps.

- A. What is the length of the longest subsequence between X and Y?
 B. What is the longest common subsequence between X and Y?

Q2) [2.5] Solve the all-pairs shortest-path problem for the following graph:



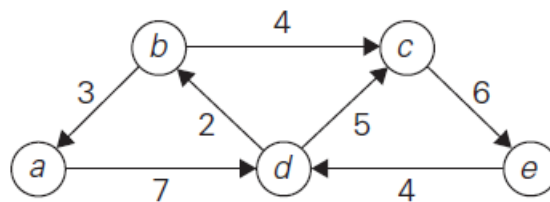
Apply the Floyd-Warshall's algorithm, as in the text book:

$$d_{ij}^{(k)} = \min\{d_{ij}^{(k-1)}, d_{ik}^{(k-1)} + d_{kj}^{(k-1)}\} \quad \text{for } k \geq 1, \quad d_{ij}^{(0)} = w_{ij}. \quad (8.14)$$

Make sure to show the following matrices in your solution: $D^{(0)}$, $D^{(1)}$, $D^{(2)}$, $D^{(3)}$, $D^{(4)}$, $D^{(5)}$.

II. Greedy Algorithms.

Q3) [2] Solve the following instances of the single-source shortest-paths problem with vertex a as the source (show all solution steps):



Q4) [1.5] Apply Prim's algorithm to the following graph. Include in the priority queue all the vertices not already in the tree.

